

SCABIES  
AND ITS RELATIONSHIP TO PYODERMIC INFECTION  
IN WARFARE.

Thesis for the degree of M.D.

by

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## I N T R O D U C T I O N .

In all forms of warfare, no matter what may be the "casus belli", the ultimate end in view is victory in the field; and as a means towards this end the maintenance and efficiency of man power is a factor second in importance only to the strength and equipment of the forces employed. Such an assertion is so fundamental as to be almost one of the axioms in warfare, but this very fact only serves to emphasize the importance and value of an efficient army medical service. The duty of a medical officer on active service is to maintain the health and fighting efficiency of his troops at the highest possible level, and in the exercise of this duty every detail counts towards the ultimate triumph in view.

The soldier rendered unfit to take his place in the firing line by reason of some such trivial affection as Scabies is, for the time being at any rate, as much of a loss to his army as is his comrade who has been seriously wounded. In addition to his loss as a unit in the firing line, the soldier with Scabies is a potential source of infection to the troops with whom he comes in contact, and therefore/

therefore merits additional attention from the army medical point of view. No doubt, from a purely spectacular point of view, the treatment of severe gun shot wounds in the field may be much more impressive; and certainly the literature on this subject during the war has been much more abundant; but still the bald and unromantic fact remains that 'qua' fighting strength for the time being, the loss of the soldier with itch is as great as that of the severely wounded case.

During the war Scabies and Impetigo, though in a sense trivial complaints, were nevertheless responsible for the temporary invaliding of thousands of otherwise able bodied men.

<sup>1</sup>  
McCormac and Small state that when pyodermic infection complicates Scabies, the average stay in hospital of such cases amounts to 31.67 days in a Base Hospital. This period does not include the time spent in Field Ambulances, Casualty Clearing Stations etc. before reaching the Base, nor does it include the time spent in travelling. So that from first to last such cases must have been away from the firing line for much longer than the average time stated above by McCormac and Small. Taking into consideration, therefore, the great prevalence of Scabies, especially during the first two years of the war/



war, the importance of this condition in placing men 'hors de combat' for a considerable time is enormous; and in view of this fact I feel that no apology is necessary in discussing the subject in this thesis.

It would be most interesting and instructive to find out what was the incidence of Scabies and its complications, in previous campaigns, but in my effort to do so I have found the literature on the subject most scanty.

As far as it appears, the ancient Latin and Greek physicians have left no record of the diseases afflicting ancient armies. One would have thought, as the waging of wars was the chief study of the ancients, that their records on the care of the sick might have been good in proportion to the records of their skill in other branches of the military art; but it is to be regretted that such is not the case. Xenophon, Pliny, Livy etc. have described certain of the more common diseases met with in ancient armies, but on such subjects the ancient physicians are silent. The "Psora" of the Greek writers, and the "Scabies" of the Latins, have been supposed to be the same eruption as we now know it, yet the itch does not seem to have been one of the great scourges of ancient armies, since they take such particular notice of other cutaneous "foulnesses", and leave the itch entirely/



entirely out of their accounts.

In his book entitled "Observations of the Diseases of the Army in Camp and Garrison"<sup>2</sup> (1752), Sir John Pringle is the first in this country to give an account of the itch in warfare. Its prevalence among the troops waging war on the Continent in these times may be judged from his allusion to the itch as "the most general distemper among soldiers"; being so frequent in camps, barracks and hospital as to be reckoned one of the military diseases".

In the Napoleonic wars the sufferers from itch were counted by the hundred thousand.

<sup>3</sup>  
According to Peters in the hospitals of Prague in 1866 the number of patients admitted with itch was 1129, while in 1867 the number was 2256. In the years following, there was a decrease proportionate to the rise. There was a state of war there in the year 1866, and Peters' observation is of interest as it shows how, in the year after the war, there was such a rise in the number of cases even in a civilian hospital.

During the American Civil War, out of an army of some 600,000 men, 32,000 cases were diagnosed as itch; another 35,667 being merely recorded as skin disease.

<sup>4</sup>  
Manson's description of this campaign shows that in these cases of itch the lesions were so severe that there/

there was great difference of opinion at the time concerning the pathology of the affection.

In the more recent campaigns e.g. South African War, we find that Scabies was one of the great scourges, and one of the chief causes of sickness, with its consequent loss in fighting strength; so that, even before the commencement of the great war in 1914, we had ample historical precedent to show that the question of Scabies in the field was a most serious problem.

During the war I spent four years on active service on the Western Front. Of that time six months were spent with an infantry battalion at the front; six months at a base hospital where, amongst other things, I had charge of two wards set aside for skin diseases; six months on an ambulance train plying between the front and the base hospitals; and two and a half years with cavalry regiments at the front. I had therefore ample opportunity for observing the commoner skin diseases in all their stages; and in the present thesis my intention is to record my observations regarding Scabies, with special reference to the pyodermic complications of this condition.

### TYPES OF PYODERMIC INFECTION.

In the year 1870 Hebra wrote:- "All pustules must be regarded as secondary morbid products, and hence are not fitted to form an independent series of cutaneous diseases."

5

Allan Jamieson, in his book on "Diseases of the Skin", also emphasises the secondary nature of pyogenic lesions as follows:-

"Though it is true that pustules are, for the most part, a further stage of eruptions of a different character, and therefore do not strictly deserve the name of primary symptoms, we are constrained to speak of pustular diseases of the skin; and this term enables us to group together some morbid states which are otherwise rather difficult to reduce to a more definite category."

Under the category of Pustular Diseases he describes boils, impetigo contagiosa, ecthyma, sycosis, and dermatitis capillitii papillaris.

In dealing with this subject, in order to save needless repetition, I make use of the word "Pyodermia" (which literally means pus formation in the skin) to denote all forms of skin disease associated with pus formation; but especially the forms/



forms most frequently met with on active service viz. impetigo, boils and ecthyma. Although Pediculosis 'per se' is not included in this group, the scratching and secondary pyogenic infection to which it so often gives rise are so characteristic features of the condition that, although not strictly pyodermic in nature, it is undoubtedly potentially pyodermic. Likewise Scabies, when uncomplicated is not a pyodermic infection; but in consequence of the hard conditions of active service, complications are very frequent, and consequently various types of pyodermic infection may result from it.

The outstanding fact which strikes one, when dealing with skin diseases in a military hospital, is the great frequency with which pyogenic infection is met; and I propose first of all to deal with this question from the Base Hospital point of view.

From November 1915 until April 1916 I had charge of wards set aside for skin diseases in a general hospital at the base in France; and during these six months I was able to investigate the subject of pyoderma as a complication of Scabies. While there, I assisted Major MacCormac, the officer in charge of the dermatological section of the hospital, and to him I am indebted for the following statistics showing/

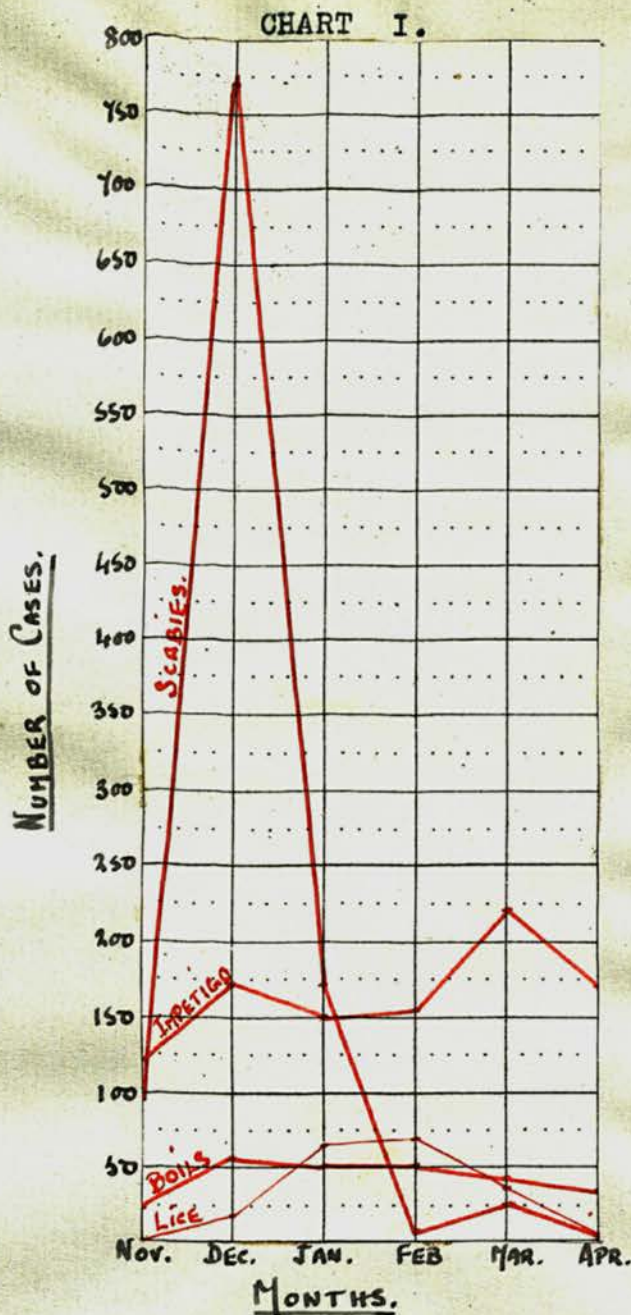
showing the incidence of the different types of infection we dealt with there. The first table gives a comparative analysis of the admissions into hospital of the five types with which we are dealing viz.

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total	% Approx
Scabies	95	770	170	8	25	5	1073	43%
Impetigo	122	172	151	161	220	170	996	38%
Boils	24	59	50	51	42	36	262	11%
Pediculosis	-	17	62	69	36	3	187	8%
Ecthyma	-	-	1	2	-	-	3	-

Represented graphically, these admissions are as follows.

CHART I./



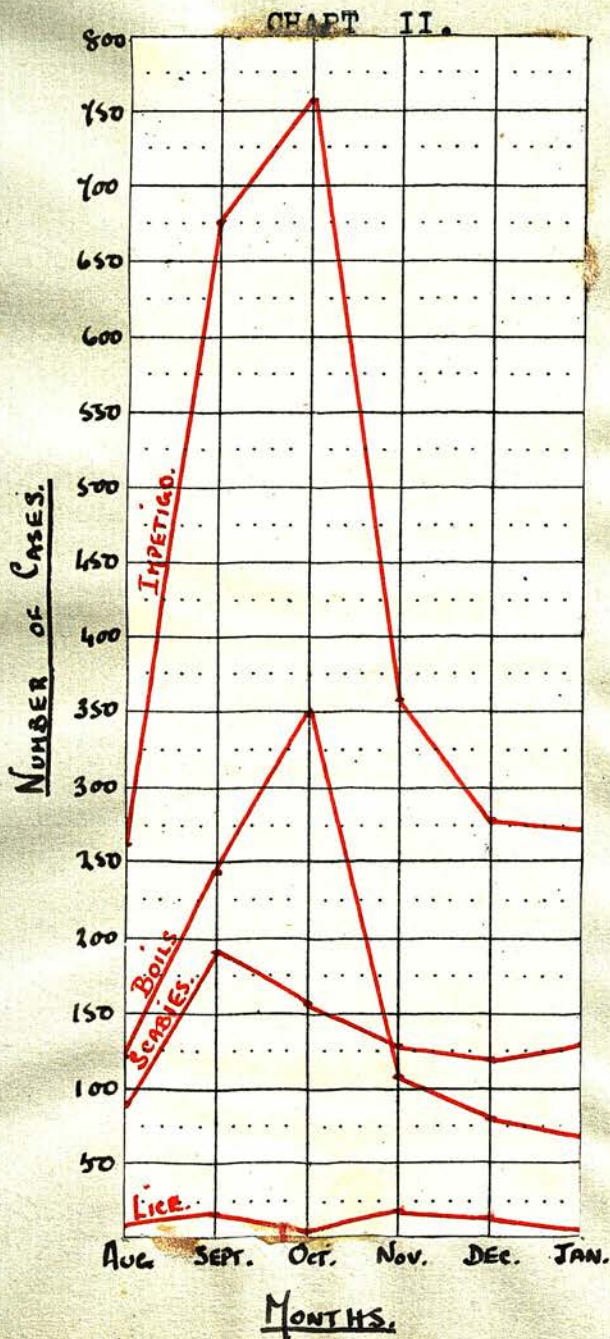


The great rise in the Scabies curve for December was due to the arrival of several new divisions from home at a large reinforcement camp in the vicinity of the hospital. The majority of these December cases were slight, early and uncomplicated cases of Scabies.

As/



As a somewhat erroneous impression of the relative incidence of Scabies is got in the earlier part of the last graph, due to the unusually rapid rise in the Scabies curve for December, I give below a further graphical representation of a later series of admissions to hospital, published by Major <sup>6</sup> MacCormac.





This graph gives a very vivid impression of the relative incidence of the diseases portrayed, the similarity in shape between the curve of Scabies, and those of impetigo and boils being most noteworthy. Another striking feature being the relatively greater numbers of impetigo and boils as compared with those of Scabies.

Apropos of this graph, Major MacCormac points out that the rise in the curves corresponds with, and to a large extent results from, the offensive operations undertaken by our troops on the Somme during September and October. Also from an analysis of 1000 of these cases, diagnosed as Scabies, boils and impetigo, he concludes that 65.9% can be directly attributed to Scabies. My own observations on the cases figured in Chart I. above had convinced me that over 50% of the cases of impetigo and boils owed their origin to pre-existing Scabies; and are corroborated by the figure quoted later by Major MacCormac.

Another valuable contribution to our knowledge on this subject was given by Captains <sup>7</sup> Semon and Barber. These observers, working in another base hospital, came to the following conclusions:-

"Out of a total number of 669 patients admitted under our personal care between April 1st. and May 9th. 1917, 631 i.e. 94.3% were cases of pyoderma/

pyodermia of parasite origin."

They analyse these 631 cases of pyodermia thus:-

Pyodermia (631)

Scabies 171 (37.6%)	Pedicu- losis 257 (56.9%)	Scabies and Pedicu- losis 24 (5.5%)	Seborr- hoea. 112	Others 67
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The preponderating percentage of pediculosis cases is very apparent; and the striking fact in this analysis is that out of a total of 631 cases of pyodermia, 452 i.e. 71.6% were associated with a parasite, either the acarus or the louse.

In comparing these two sets of observations it will be seen that the main difference lies in the condition giving rise to the pyodermia. Whereas Semon and Barber found pediculosis as the causal factor in 56.9% of their pyodermic cases; 69.5% of such cases were found by MacCormac to be attributable to Scabies. This great disparity in their findings is doubtless due to the fact that the different investigators were investigating the etiological factor from different standpoints. However, the outstanding feature of these analyses is the large percentage of pyogenic infections among the skin diseases in a base hospital, and the relatively small percentage/



percentage of simple and uncomplicated lesions.

And in this matter it is most interesting to note that the same state of affairs prevailed in enemy hospitals during the war.

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A paper by Krystalowicz gives statistics of a series of cases in the Austrian Army. From October 1st 1914 until February 28th 1915 he had under his care 331 cases of skin disease in soldiers; of which 86 i.e. 26% were Scabies. Out of these cases of Scabies, only one third were uncomplicated, the remaining two thirds being complicated by various pyodermias in the form of folliculitis, impetigo, ecthyma, furuncles, abscesses and severe dermatitis. Another group of suppurative dermatoses were not the result of Scabies viz. 74 cases of folliculitis, 29 of furuncles and abscesses, and 5 cases of sycosis. These were the result of pure staphylococcic infection. A further group of 48 cases of ecthyma and impetigo were probably due to streptococcic infection to which a staphylococcic infection was superadded.

From the observations given above by the different authorities it is quite evident that pyogenic infection of the skin assumes great importance as a complication in warfare, and my observations at the base hospital quoted, confirmed this view absolutely.

But/

But all observations and statistics on this subject have dealt so far only with the cases as seen in hospitals at the base; and no one, so far as I am aware, has made a corresponding set of observations on these diseases as they are met with first of all among the troops at the front. Of course in trying to make reliable observations, the regimental medical officer at the front encounters great difficulties owing to the continuous changes in the personnel of a regiment, the rapidly alternating periods of action and inaction, and the difficulty of following up cases after they have been evacuated to hospital. However, from the records of the cases I sent to hospital owing to skin diseases while at the front, I think the undermentioned facts of interest when taken in conjunction with the statistics I have already given from cases at hospitals at the base.

#### INFANTRY:-

While serving with an infantry battalion in the line on the western front in 1915, the skin conditions which came before me presented great difficulty in diagnosis and treatment owing to the heterogeneous character of the lesions. In these early days of the war the facilities existing for weekly medical inspections of the troops, regular weekly baths with change of underclothing, disinfection of clothing and/

and blankets etc. were by no means perfect, and on this account it is not surprising that the characteristic of skin affections at that time was the multiplicity of the lesions found in any one case; especially as the periods spent in the trenches were often unduly long, and the periods for rest and cleanliness often unduly short. At that time it was rather the exception to find uncomplicated cases of Scabies in consequence of the hard conditions of service, and the various types of pyodermic complication were of very common occurrence.

Of 42 cases sent to hospital owing to skin trouble during that time.

7	or	16.6%	were	uncomplicated	cases	of	Scabies.
5	"	11.9%	"	"	"	"	Impetigo.
2	"	4.8%	"	"	"	"	Boils.

It will thus be seen that of these cases sent to hospital, the total of uncomplicated cases was 33.3%; whereas the majority (66.7%) were complicated, the three different forms of lesion mentioned often being present on the one case.

#### CAVALRY:-

For over two years I served with cavalry at the front, and of 60 cases sent to hospital during that time suffering from skin complaints



7	or 11.6%	were uncomplicated cases of Scabies
10	" 16.6%	" " " " Impetigo
17	" 28.4%	" " " " Boils

In this series, therefore, the total of uncomplicated cases is 56.6%, as compared with the total of 33.3% got with infantry.

#### COMPARISON:-

Of course many fallacies arise in comparing the relative incidence of pyodermic complications in the two branches of the service just mentioned, but from the cases quoted we see that, broadly speaking, pyogenic infection was very much more frequent in foot soldiers than in the case of the mounted troops. The reasons for such I shall discuss later when dealing with the etiological and prophylactic sides of the question.

But these figures are much more significant when taken in conjunction with the figures given by the observers at base hospitals.

For instance, while serving with the cavalry, I held a weekly inspection of the regimental personnel with a view to detecting and isolating early cases of skin disease, in addition to examining all new drafts and reinforcements reaching the regiment from other quarters. At these weekly inspections, early cases of Scabies etc. were detected, isolated and treated regimentally./

regimentally. Of the cases so treated I found it necessary to send only 12.5% to hospital for further treatment; whereas the remainder (87.5%) got rid of their infection regimentally. Naturally the large majority of the cases which recovered under regimental treatment were of a much milder type than the cases it was found necessary to evacuate to hospital; but the point I wish to emphasize here is that nearly all these cases which never reached hospital were uncomplicated cases of Scabies, boils, impetigo and pediculosis such as we are accustomed to see in civil life, and consequently easily cured, provided suitable remedial measures are taken.

Therefore, of all the cases of skin trouble which I saw and treated early while with the cavalry, roughly 87.5% were uncomplicated and recovered regimentally. 12.5% were sent to hospital, but of these 56.6% were uncomplicated when they left; thus showing that of all cases occurring, only 5.8% were complicated by pyogenic infection when first seen at the front.

When a similar calculation is made from the infantry figures, then of all cases seen, it was found that roughly 9% were complicated to begin with.

When compared with the overwhelming preponderance of pyodermic complications I found whilst working in the base hospital, verified statistically by MacCormac, Semon/



Semon and Barber, and Krystalowicz in different hospitals at different times; it seems difficult to reconcile the relatively negligible percentage of the cases I found showing pyodermic complications when seen first of all among the troops at the front.

I have endeavoured to find out if my observations and figures at the front corresponded with those of others working there, but so far I have not been able to find any records of such a nature. However, from verbal opinions expressed by several medical officers serving with units at the front, I gathered that in no case did they encounter complications of a pyodermic nature to anything resembling the extent with which such complications are met later on when such cases reach the base hospitals.

SCABIES.

Among the parasitic diseases that have been known in every age and in all parts of the globe, the itch takes the foremost place; but for the present purpose I intend to deal only with its more characteristic features, especially from the etiological and prophylactic standpoints, as met with in warfare.

SPREAD OF INFECTION:-

With regard to the method in which the itch is spread, it is most interesting to note the views of Sir John Pringle<sup>2</sup> on this subject. In his book entitled "Observations of the Diseases of the Army in Camp and Garrison" he records his experiences during the continental wars of the 16th century. There he says

"The itch spreads so easily by contact of the foul person or of his clothes, that one in the same tent, mess or barrack, will quickly communicate it to the rest. Though of a contagious nature, the infection is communicated only by the contact of the foul person, of his clothes, bedding etc. and not by effluvia, as in dysentery and malignant fever. It is confined to the skin, and seems best accounted for by Leeuwenhoek, from certain small insects he discovered/



discovered in the pustules by the microscope."

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Sir Malcolm Morris in this connection points out that

"The bed clothes or underclothing of subjects of Scabies may possibly act as media of contagion, but usually it is only by prolonged and intimate contact between healthy and infected subjects that the affection can be conveyed. The signs and symptoms generally appear after a period of latency of about 10 days, but in some cases as little as 2 days, in others as long as a month."

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Again, Allan Jamieson says of it:-

"It is communicated almost invariably by sleeping in the same bed with one who has it. Some have thought that possibly pregnant females (acari) may be dislodged by scratching from the burrow, and for a time live in blankets or bed linen, and thus gain access to the skin of a second person. Displaced crusts may also contain mites. The period of incubation before the disease is developed is said to extend over 3 or 4 days."

It is obvious that the incubation period, i.e. the time which elapses between infection by the acarus and the first appearance of symptoms, is, as far as we know, of very variable duration ranging perhaps/

perhaps, as Sir Malcolm Morris states, from two days to a month; and consequently this variability in the period of incubation is a great obstacle in the path of anyone who endeavours to track down the cause of infection in any given case or set of cases, especially as the environment of troops in the field is changing constantly.

However, when troops are fortunate enough to get a long rest following on a long spell of trench work, one can form a rough idea, at any rate, of the general environment which favours the spread of infection. For instance, the infantry battalion to which I was attached had about three weeks of constant and severe fighting during the critical days of the Second Battle of Ypres in May 1915, during which time the men had time neither to take off their clothes nor to change their underclothing. At a medical inspection of what remained of the battalion just after this arduous time, only two cases of Scabies were detected. The battalion was then taken back to rest for about three weeks in huts at some considerable distance behind the firing line, there to be re-equipped etc. During this resting period the men had their blankets re-issued, and slept rather crowded together in the huts. They also had two baths and two complete changes of underclothing/



underclothing during this time. In spite of this attention to their cleanliness, however, at a medical inspection of the unit at the end of the resting period, I found 8 cases of Scabies sufficiently far advanced to go to hospital, and three times that number of slight commencing cases which were treated and got better regimentally. I had another opportunity of judging the effects of rest and action over long periods during about three weeks spent in back billets just prior to the Battle of Loos in September 1915. This was followed by over a fortnight spent in action; and here again, although the order of action and rest was reversed, I found exactly the same state of affairs, viz. that after a prolonged stay in rest billets there was a much greater incidence of Scabies than after a prolonged period in action. In both the cases quoted long periods have been chosen, in order that the cases which take a long time to incubate might also be included.

Having always been imbued with the idea that the principal determining factor in parasitic diseases of the skin was the appreciation of the care of the skin and the consequent development of a sense of cleanliness, I found it very difficult to explain the somewhat analogous state of affairs referred to above i.e. that the incidence of Scabies in the battalion should/

should be greater during the resting periods, in which time alone there existed facilities for personal cleanliness in the form of baths, clean changes of underclothing etc. Also that, provided the men went into action clean, there should be practically no fresh cases of Scabies, in spite of the fact that while in action there existed no facilities for the observance of personal cleanliness.

I have thought of all the possible and probable explanations which might account for this; and my opinion now is that the cause of infection lay mostly in the blankets with which the troops were issued while at rest. Moreover, on purely theoretical grounds this explanation is most feasible in the light of Sir Malcolm Morris's description of the mode of spread of itch, referred to above. For the acarus does not stray about indiscriminately like the louse; and therefore, for infections to occur, a prolonged and intimate contact is necessary. This infected material was undoubtedly to be found in the blankets issued to the men while back resting; especially as, during these days in 1915, no regular and systematic apparatus for disinfecting the blankets of the fighting troops on a large scale was in vogue. Also, their opportunities for getting off their clothing and/



and coming into intimate contact with infected material were only possible when out resting.

Corroborative evidence of the role played by infected blankets was furnished to me later while serving with cavalry. Then I had repeated opportunities of comparing the relative incidence of itch during alternating periods of rest and activity, but during this time I never found that change in environment played such a great part in the number of cases. This, I take it, was due to the regular disinfection of the blankets in steam disinfectors mounted on Foder lorries, a practice which, unfortunately, did not prevail in 1915 to anything like the same extent.

#### TYPE OF ACARUS:-

Another etiological factor, regarding which there is considerable diversity of opinion, is the determination of the type of acar<sup>1</sup>us responsible for the lesions.

MacCormac and Small state that "a few cases seem to be contracted from horses, and the protection of the soldier therefore includes efficient treatment of the horse"; and the majority of the French medical officers with whom I came in contact looked upon this method of spread as of considerable importance.

That such is the case, however, I have never been able to satisfy myself.

In/

In the first place, in my experience, mounted troops seemed to suffer much less from Scabies than did foot soldiers; at least my records showed a much greater incidence amongst infantry than amongst cavalry. Of course this fact may be a mere statistical coincidence, and with so many different etiological factors coming into play, it would be a glaring example of the 'post hoc ergo propter hoc' fallacy to draw from such records the direct conclusion that therefore no infection was transmitted from horse to man. But such evidence was presumptive enough to stimulate me to investigate the matter more fully, and the somewhat frequent occurrence of isolated cases of mange in horses gave me the necessary opportunities for such investigation. In no case, however, have I been able to associate a case of human Scabies with the similar condition in a horse; and if such transmission of infection were possible, surely no better conditions for its occurrence could be imagined than the very conditions obtaining in the case of a cavalry man, who carries his own personal blanket folded up along with his horse's blanket under the saddle, thus ensuring the 'prolonged and intimate contact' which authorities regard as the 'sine qua non' for the spread of infection by the acarus.

Again, on two different occasions I had the opportunity/



opportunity of getting a comparison made between an acarus from a mangy horse and an acarus isolated from a case of human Scabies, and on both occasions the varieties were found to be quite distinct. In this connection the following extract from MacCormac's article on "Skin Diseases under War Conditions" is of interest. In dealing with the complications of Scabies, he writes:-

"These complications are so severe as to suggest the presence of an unusual type of acarus. Specimens were sent to the British Museum. Mr Hurst very kindly examined them for me; he reports that the examples certainly seem to belong to the human variety. The size is quite typical; and also the structure of the dorsal scales, which are longer than wide and acutely pointed, instead of being rather shorter and blunter as in var equi."

#### PATHOLOGY:-

As the character and distribution of the lesions in Scabies have been so admirably dealt with by MacCormac and Small<sup>1</sup> and by so many other writers, I do not propose to give a description of this subject again here. However, the asserted freedom of the hands from lesions requires a little consideration.

<sup>6</sup>  
MacCormac/

6

MacCormac asserts that the hands are often entirely free from lesions; while in 60 consecutive cases examined by Small, he found the pathognomonic interdigital burrows to be present in only 13% of the cases. While my experience in a base hospital corroborates the views of both these observers regarding the cases seen there, I do not on that account draw the general inference which they do, viz.

"That Scabies as seen amongst soldiers differs in type from that met with in civil practice." especially as I proved to my satisfaction at the front that, provided the cases are got early enough, nearly all men showing lesions of Scabies present the typical interdigital burrows. In fact, when compared with such cases as seen in civil life, I could detect no great difference in the character and distribution of the lesions as seen in early cases at the front, all cases there being seen relatively early.



TREATMENT OF SCABIES:-

Fifty years ago Hebra wrote as follows:-

"There is, perhaps, scarcely any other curable disease for which so many various remedies have been proposed as for Scabies. Those enumerated in medical works amount to hundreds."

During the war there was no subject in dermatology about which more was written than the treatment of Scabies, and here again I do not intend to enter into a detailed description of all the advantages and disadvantages of the different remedies advocated, as the scope of the present thesis will not admit of such a colossal undertaking. Nor do I claim that the treatment which gave me the best results is in any way novel, as I find from his books that Sir John Pringle<sup>2</sup> adopted the same measures in a modified form two centuries ago. Apropos of the treatment of itch, he writes:-

"Sulphur is the specific

R/

Sulphur Viv. - unc. I

Sal Ammoniac Crud. - dr. I

Ung. Porcin. - unc. II.

Misc. f. unguent.

This quantity served for 4 inunctions, and the patient was rubbed every night; but to prevent any/

any disorder that might arise from stopping too many pores at once, only a fourth part of the body was anointed at one time. The itch may thus be removed by one pot of ointment, but it may be proper to renew the application; and in the worst cases to subjoin the internal use of sulphur to diffuse the steams more certainly through the skin; as the animalcula may lie too deep to be thoroughly destroyed by external application only."

As the cases I saw at the front were practically similar as regards the character and distribution of the rash to the cases of itch one meets with in civil life, I could see no reason for departing from the well known and old established methods of treatment practised at home. I therefore adopted the therapeutic measures of Dr Norman Walker as I had been taught them in the wards of the Royal Infirmary, Edinburgh, and as described in his "Introduction to Dermatology" viz.

"Order the patient to have a hot bath in which he soaks himself for half an hour, and with a soft nail brush scrubs the most affected parts. On coming out he should dry himself, seat himself before a fire (if any) and rub sulphur ointment/



ointment thoroughly in all over. The rubbing should be repeated on five subsequent occasions at intervals of twelve hours. On the morning following the last application the patient should take another bath, put on fresh clothes, and, if the directions have been properly carried out, he may be considered cured."

As a therapeutic measure in the field this method possesses the great advantage of simplicity in application, while its cheapness is of the utmost importance from the point of view of the army. In addition to the two attributes just mentioned, however, it possesses the more valuable quality of reliability as regards results, provided the details of the treatment are conscientiously carried out. When the exigencies of the service permitted, I followed to the letter the details of treatment described by Norman Walker as above; such luxuries as hot baths, changes of underclothing, and warming before fires being omitted when the conditions of service were of a more exacting nature. So good and reliable were the results of this treatment that I never at any time felt myself justified in adopting any alternative measure, even solely from an experimental point of view. Reliable as is the sulphur ointment method of treatment, however, it is far from being fool proof; and/

and in order to get reliable results the method of treatment must be efficiently and conscientiously carried out under supervision. In civil life a doctor who gives advice and prescribes treatment may rest assured that the majority of his patients so prescribed for will at any rate do their best to follow the instructions given. But not so in the army; and the medical officer who supplies a soldier in the field with some sulphur ointment, in the hope that his instructions as to treatment will be followed, is, in my opinion, living in a fool's paradise. I had not been long on active service before I recognised that the characteristic psychological attitude of the soldier in the field was one of passive acquiescence to the dictates of routine and environment, the veritable incarnation of the "laissez faire" policy. Nor is this to be wondered at when one considers his relation to the high command of the army. Ordered as he is to parade for all things pertaining to his physical, mental and spiritual well being e.g. rations, clothing, baths, clean underclothing, pay, weekly medical inspection, divine service etc, he naturally becomes imbued with an almost childlike faith that "the army" will supply all his bodily needs as far as the exigencies of the service permit, and that all required/



required of him is to attend parades and obey instructions. In addition, he knows that it is the duty of the regimental medical officer to keep him in as good a state of health and as free from infection as possible. What then is the probability that such a man will carry out efficiently the application of the pot of sulphur ointment with which he has been supplied? The probability is remote in the extreme, and it is on this account that I preferred to leave nothing to chance when treating men with itch, possessing as they did such potentialities for wide-spread infection.

All men found, either at the daily sick parade, or at the weekly medical inspection, to be suffering from Scabies in any form, were paraded at the Aid Post or medical inspection room twice a day for treatment under my own personal supervision or that of the regimental medical corporal. The treatment as described above was applied as literally as circumstances permitted, the main points to which special attention was applied being

- (a) The opening up of all unruptured vesicles with a needle before the application of the ointment.
- (b) The liberal application of the ointment, well rubbed in, to all parts of the body, especially the/

the hands, wrists, buttocks and penis.

- (c) The final disinfection as far as possible of all the patients clothing and blankets after treatment.

Most cases were completely cured by three days of such treatment. If not, then my rule was to forestall the possibility of sulphur dermatitis by stopping sulphur for three days and substituting therefor a 2% ointment of Beta-naphthol in vaseline before going on with the sulphur ointment again.

It is needless to say that men with Scabies were isolated, while their blankets and clothing were disinfected as far as was possible under the circumstances; such prophylactic measures being of the utmost value in preventing dissemination of the infection. That such prophylactic refinements, however, were not essential from the purely therapeutic standpoint of effecting a cure, I was able to satisfy myself on the many occasions when isolation of men and sterilisation of clothing were quite impossible. On such occasions all that could be done was to get the infected man well rubbed with the ointment all over, and leave him to do his duty in this state until the advent of more peaceable times, with the possibility of a bath and change of clothing. In the case of the men, who under such/



such circumstances had neither blankets nor change of clothing, the results of such treatment were exceptionally reliable; the sulphur ointment fulfilling the double and simultaneous function of curing the lesions while also disinfecting the clothing which the man was wearing. In fact, the sole anxiety one had in such cases was to guard against the possible advent of sulphur dermatitis. In the case of officers and warrant officers, however, who at such times had generally access to at least one blanket and one change of underclothing, the results of such treatment were by no means so good; and this, I take it, was due to the circulation of infection between body, clothes and blankets.

#### PROPHYLAXIS:-

As each undetected case of Scabies is the potential source of widespread infection, it is imperative that every man in a unit should be subjected to a thorough medical inspection regularly once a week; and in this connection it is pertinent to emphasize the necessity of examining the whole body from head to foot, as well as the futility of examining restricted parts of the body, such as the hands, forearms and chest, a custom which was painfully prevalent in many quarters. That being so, then/

then it is evident that the most suitable time for such inspections is when the unit is paraded for weekly baths, at which time the medical officer can make a thorough examination of each man as he finishes his bath.

All men found at this inspection with any lesions of Scabies, however slight, should be isolated and treated as soon as possible; for not only does this prevent dissemination of the infection, but it also allows treatment to be commenced before complications have set in, thus helping to preserve the fighting strength of the unit. After the condition has been cured, disinfection of clothing and bedding should always follow. Of course all the clothing may be disinfected, but unfortunately steam disinfectors were not always to be had. As a matter of fact, such mechanical treatment I found to be unnecessary. The practice I followed in the field was to brush the outer garments well and expose them to the sun and air for some time, the underclothing being thoroughly washed.

Having seen that most of the evidence pointed to blankets as being the principal means of infection; some system of regular and thorough disinfection of all blankets on a large scale should be undertaken. During/

During the later years of the war this was efficiently carried out by means of the steam disinfectors mounted on Foder lorries which visited the different units in a division as required.

In dealing with Scabies from the prophylactic standpoint, there is one aspect of the question so far, as far as I am aware, not touched upon, which merits serious consideration. As I have pointed out, the preponderating percentage of Scabies cases seen at the front are uncomplicated to begin with; whilst the great majority of such cases present manifestations of secondary pyodermic infection when seen in the base hospitals. To assert then, as is done by most of the observers in base hospitals, that such complications are a typical feature of Scabies as met with in warfare seems, to my mind, to be evading the question entirely from an etiological and prophylactic point of view. Surely there is some reason for the supervention of pyodermic infection in such cases between the time they leave the fighting line and the time they reach the base hospital. It behoves us then to enquire as to how, when and where this secondary infection takes place.

If blankets, as we have seen, can play such an important role in the dissemination of Scabies, which requires/



requires "prolonged and intimate contact with infected material" before infection takes place; is it not reasonable to expect that blankets should be equally efficacious in disseminating such virulent organisms as the pyogenic cocci which cause the pyoderma? That the pyogenic organisms can live in blankets for a considerable time has been proved beyond doubt.

After the sick man left the front, he was admitted in succession to a field ambulance, a casualty clearing station, an ambulance train, and often a stationary hospital before finally reaching the base hospital. At each of these places he was enveloped in a different set of blankets, which were, unfortunately not always clean, as disinfection in every case was well nigh impossible under the circumstances. With so many changes of blankets, many of which had been previously infected, it is only natural that complications of skin lesions should have been the rule rather than the exception.

IMPETIGO CONTAGIOSA.

As the nomenclature of the condition to which this name applies has been the subject of so much dispute in the past, and as so much confusion has existed in the use of the term, it may be well to point out that by true Impetigo I mean the special streptococcic phlyctenular eruption as described under the name Impetigo Contagiosa by Tilbury Fox.<sup>10</sup>

ETIOLOGY:-

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According to Dr Sabouraud there are three prevailing cocci found in the skin viz.

- (1) The Streptococcus, which is the cause of the impetigo contagiosa of Tilbury Fox.
- (2) The Staphylococcus Aureus, which invades the follicular orifices and causes pustules, being the cause of all primary and secondary pustular lesions.
- (3) The Staphylococcus Griseus, which causes Pityriasis Simplex and Seborrhoeic Dermatitis.

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Andrewes and Horder have shown that there are seven different types of Streptococcus pathogenic for man; but until the outbreak of war in 1914 the types of this organism pathogenic to the skin had never been satisfactorily worked out. The Streptococcus pyogenes was/

was then known to be the causative organism of erysipelas, and the same organism was looked upon as the cause of impetigo.

6

During the war, however, Capt. Henry R.A.M.C. examined strains from three cases of impetigo at the base, and found that the predominating organism was one which had the cultural characteristics and sugar reactions of *Streptococcus Faecalis*. On one occasion I was fortunate enough to be in the vicinity of No. 3 Mobile Laboratory just a few miles behind the firing line, and there similar investigations were carried out by Major McNee and Capt. McCartney. In these cases of impetigo, fresh from the front, the predominating organism was again found to be the *streptococcus faecalis*.

That such an intestinal organism was so consistently found in such cases was most interesting and instructive, but not altogether surprising when one thinks of the possibilities for such infection which exist in the imperfect sanitary conditions obtaining at the front.

#### MEANS OF SPREAD:-

It has been proved both clinically and experimentally that the eruption of impetigo is highly contagious; being, as Allan Jamieson puts it "both auto-inoculable and communicable to others". It is also a well known and/



following Scabies is that most commonly met with, and in such cases the lesions are distributed mainly on the buttocks, knees and elbows. MacCormac looks upon impetigo of the buttocks as pathognomonic of Scabies, and in my experience such a view is highly justifiable. In the cases originating from pediculosis the lesions are more pustulo-vesicular, and suggest a mixed infection of streptococci and staphylococci, though the pustular contents are often due to secondary staphylococci.

(3) Ecthyma is the deep variety of impetigo, generally seen on the legs, thighs and buttocks. The typical condition consists of a deep undermined ulcer full of septic matter, and covered over by a crust. Ecthyma of this kind was of very frequent occurrence in military hospitals, a frequent cause being the vigorous scratching to relieve itching caused by Scabies and lice. A full description of this condition, with excellent paintings showing the nature of the lesions met with on active service, is given by MacCormac in the British Journal of Dermatology 1917; so it is unnecessary for me to pursue the matter further.

#### INCIDENCE:-

The prevalence of impetigo may be seen from the tables/

tables of statistics and graphs in the section I devoted to the discussion of Pyodermia. There it will be seen that out of the total number of admissions of the skin diseases under consideration into the hospital in which I worked, 37% were cases of impetigo.

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MacCormac, however, found a much larger percentage.

He writes:-

"During April 1917, out of a total of 1,786 patients admitted with skin complaints into the General Hospital, it was found that 1,411 (i.e. about 80%) suffered either from primary impetigo or from impetigo grafted upon some other condition."

From the graphs I have drawn it will also be observed that in a base hospital the cases of impetigo greatly outnumber those of any other skin complaint, even Scabies. But this high figure tends to give rather an erroneous impression of the relative incidence of true impetigo, as the number includes impetiginisation following Scabies and other skin conditions. MacCormac says:-

6

"I do not suppose among the 5000 odd cases of impetigo quoted, that there have been 50 instances of true impetigo contagiosa."

These facts, when taken in conjunction with the small percentage of complicated lesions I found at the front/

front, show that a very large percentage of the men, who are evacuated from the front with simple and uncomplicated skin lesions, develop secondary complications by the time they arrive at the base hospital, by far the most frequent complication being the impetiginisation of previously existing dermatoses.

TREATMENT:-

With regard to the treatment of impetigo in warfare, this subject has already been discussed at length in the British Journal of Dermatology, so there is no need to elaborate it further here, especially as the methods employed on active service differ in no fundamental respect from the usual methods employed at home.



BOILS.INCIDENCE:-

From the hospital statistics I quoted while dealing with the subject of pyoderma, boils were seen to be the cause of 11% of the admissions of all skin complaints into the hospital in which I was serving; and from the accompanying graphs it can be seen that a marked similarity exists between the incidence curve of boils and the curves of Scabies and Impetigo.

Again, of the total skin disease cases I quoted as having been evacuated sick from the front line, in the infantry 4.8% were uncomplicated cases of boils, while in the cavalry 28.4% were cases of this nature. But even the cases sent to hospital from a cavalry regiment represent a very small percentage of the cases of boils met with. From the records of my morning sick parades while serving with cavalry, I found that 45% of those parading sick did so on account of boils. A consideration of the etiological factors at work may throw some light on the great preponderance of this complaint among mounted troops.

ETIOLOGY:-

The causative organism has long been known to be the Staphylococcus Pyogenes; and the boils one sees in warfare are no exception to this finding, as I had the/

the opportunity of proving on several occasions.

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A consecutive series of 47 cases of boils occurring in the British Red Cross Hospital, Netley, in 1917, were found, with one exception, to be caused by the staphylococcus aureus.

Boils following Scabies almost always contain streptococci in addition to Staphylococci.

That the lesions on active service could be attributed to such constitutional disturbances as diabetes, alcoholism, dyspepsia, lack of nourishment etc., I cannot imagine. That boils were caused by the lack of fresh vegetables in the field was a most prevalent idea both among officers and men at the front; but on no occasion was I able to associate any marked diminution in the incidence of this complaint with the procurability of fresh vegetables.

In the case of the infantryman, I found that the neck and shoulders were the sites of infection in the great majority of cases; while with the mounted troops the buttocks and legs were the sites of infection in over 90% of the cases; thus showing that the distribution of the lesions is to a large extent determined by local irritation, a fact which is well known.

Rather a striking fact, however, was that the incidence/

incidence of boils amongst cavalry was much greater in summer than in winter. Having heard previously that boils were very prevalent in hot countries, I naturally attributed this increased summer incidence to the greater perspiration at that time, and the consequent infection of sweat glands. But my attention was soon drawn to another etiological factor of great importance, the wearing of underclothing. I found that a large proportion of the men who had not been troubled with boils during the colder months, began to develop successive crops of boils about the thighs and buttocks after discarding their underpants during the warm weather. Moreover, by advocating the wearing of underpants to such men, it was found that the lesions in most cases began to diminish in intensity and eventually to disappear. This led me to investigate the matter more fully, and then I found that boils were nearly three times more common in those who wore no underclothing. Further, by advocating the compulsory wearing of underpants, it was found that the number of cases of boils fell by about 38%. Nor is this to be wondered at when one considers the traumatic potentialities which lurk within the ration breeches with which the men were issued. It would be futile on my part to attempt a description of the roughness/



roughness of the fabric and the positively injurious nature of the ragged projecting seams within these garments. They have to be worn before their inherent powers for inflicting gross skin lesions can be appreciated to the full; and even the interposition of a pair of ration underpants is not by any means infallible in protecting the skin from the ravages of such articles of clothing. Another element to be considered in the case of mounted troops is the friction of the saddle, which pulls out many hairs from their follicles, thus providing additional routes for the entrance of infection.

Having seen, then, how easily small lacerations and abrasions of the skin could be produced, it stands to reason that the nature of the lesions found would depend upon the type of micro-organism predominating on the skin and in the interstices of the clothing next the skin; and I am convinced that the powers possessed by ration breeches for inflicting skin lesions were equalled only by their powers for harbouring micro-organisms capable of infecting the lesions. It does not require any stretch of the imagination to picture how the streptococcus faecalis, an intestinal organism, comes to infect the interior of breeches and the skin in contact with them; and this explains the/

the occurrence of impetigo in these parts to a great extent. But it does not explain the occurrence of boils, which were very much more common among cavalry at the front. Why then, should infection by the Staphylococcus be so much more common than streptococcal infection? Bacteriologists have found that the staphylococcus in virulent colonies is so frequently present on the skin that it may be said to grow, if not on the normal skin, at least on the skin of the average individual. So much did Saboursaud appreciate this fact that he gave to this organism the name Micrococcus Cutis Communis. The contamination of garments by contact with other infected persons, as well as auto-inoculation, are additional factors assisting in the spread of infection. Is it, then, a matter for astonishment that boils should have been so prevalent in the sites I have mentioned?

#### PATHOLOGY:-

As the boils on active service differed in no way, except in their exceptional virulence and liability to spread, from those commonly met with, a description of the pathology of the lesions is deemed unnecessary.

#### TREATMENT:-

Most of the different methods of treatment which have/

have been advocated from time to time were given a trial, but these were all alike in being powerless and futile as regards hastening a cure of the condition. And on theoretical grounds this is not surprising, as it is quite impossible to reach the cocci by external applications and so prevent the boil from running its natural course. In the early stage Tincture of Iodine was applied as a routine measure to supply counter-irritation in the hope of aborting the boil, but principally with a view to disinfecting the surrounding skin and thus preventing auto-inoculation. A much more valuable therapeutic, or rather prophylactic measure was the frequent washing of the surrounding skin with a 1/2000 solution of Perchloride of Mercury. This measure was especially valuable when employed in conjunction with hot fomentations, the latter being found to be a frequent source of spread of infection unless the surrounding skin was efficiently disinfected. After incision and removal of the core of the boil, I found that the most efficient application in disinfecting the crater and promoting healing was B.I.P.P. (Bismuth, Iodoform and Paraffin Paste.)

In several obstinate cases which did not respond to ordinary measures, I tried a course of stock vaccine; but neither the purely staphylococcal vaccines/



vaccines nor the mixed streptococcal and staphylococcal vaccines proved of any service. Autogenous vaccines were not obtainable under the circumstances. Of four cases of generalised furunculosis of long standing, however, which were treated by a course of mixed vaccine, I found a distinct improvement in three of the cases.

According to my experience, the most important measures in the treatment of boils lie in the direction of prophylaxis. Auto-inoculation and infection of skin lesions by contaminated clothing being of such importance in the spread of the lesions, it matters not how the affection is treated, if the cause be not removed. All men presenting boils should therefore have a thorough bath, preferably containing some disinfectant, and a change of underclothing. The riding breeches, being also important factors in the cause of the complaint, should be exposed to the air, dried, and thoroughly brushed to remove gross contamination.

CONCLUSIONS.

1. Scabies, as seen during the war in the base military hospitals, was complicated by pyodermic infection in from 50% to 65.9% of the cases; whilst the same disease, as met with in the earliest stages among the troops at the front, was complicated by such pyodermic infection only in from 5.8% to 9% of the cases.
2. This great dissimilarity in the incidence of pyodermic complications was due in great part to the dissemination of pyodermic infection by means of the different sets of blankets with which the sick soldier came in contact from the time of his departure from the front until he arrived at the base hospitals.
3. Scabies, in the early stages at the front, did not differ in type from the ordinary form seen in civil practice; but presented the same character and distribution of lesions.
4. In warfare the conveyance of infection from horses to men is exceedingly rare, if it can be said to occur at all.
5. The method of treatment of Scabies which was the most reliable and the best suited to active service /

service conditions was inunction with sulphur ointment (B.P.) under supervision.

6. Prophylactic measures should include.
  - (a) Regular weekly medical inspections.
  - (b) Isolation and treatment of infected men.
  - (c) Disinfection of blankets and underclothing.
  - (d) Brushing and airing of outer garments.
7. The predominating organism in the lesions of Impetigo during the war was the *Streptococcus Faecalis*; thus emphasizing the need for attention to field sanitation and the personal hygiene of the soldier.
8. The incidence and distribution of Boils were determined chiefly by the irritation and skin lesions produced by the rough fabric of which the soldiers uniform was made. The wearing of underclothing was found to be the best safeguard against the development of boils.
9. By adopting the prophylactic and therapeutic measures above described, the average duration of the treatment of uncomplicated cases of Scabies was three days; whereas, after pyodermic complications had set in, the average time required for the treatment of such cases in base hospitals was ten times as long.



10. Early diagnosis and treatment of scabies, before secondary complications have been established, is one of the most powerful weapons in the hand of the regimental medical officer for combating undue sick wastage among the troops at the front.

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